

What is claimed is:

- 1 1. A microelectronic device comprising:
2 a package core having an opening therein;
3 a microelectronic die located within the opening of said package core; and
4 a fiber reinforced encapsulation material within the opening of said package
5 core to hold said microelectronic die within said package core, said fiber reinforced
6 encapsulation material including a polymeric resin having a fibrous filler material.
- 1 2. The microelectronic device of claim 1, wherein:
2 said fibrous filler material includes individual fibers having a length between
3 1 micrometer and 40 micrometers.
- 1 3. The microelectronic device of claim 1, wherein:
2 said fibrous filler material includes individual fibers having a length to width
3 ratio that is no less than 5.
- 1 4. The microelectronic device of claim 1, wherein:
2 said fibrous filler material includes glass fibers.
- 1 5. The microelectronic device of claim 1, wherein:
2 said fibrous filler material includes carbon fibers.
- 1 6. The microelectronic device of claim 1, wherein:
2 said fibrous filler material includes Kevlar® fibers.
- 1 7. The microelectronic device of claim 1, wherein:
2 said fibrous filler material includes ceramic fibers.
- 1 8. The microelectronic device of claim 1, wherein:
2 said fibrous filler material includes metal fibers.

FOIA b 5 - DECLASSIFIED

- 1 9. The microelectronic device of claim 1, wherein:
2 said polymeric resin includes epoxy.
- 1 10. The microelectronic device of claim 1, wherein:
2 said polymeric resin includes plastic.
- 1 11. The microelectronic device of claim 1, comprising:
2 at least one metallization layer built up over said package core, said at least one
3 metallization layer being conductively coupled to bond pads on a surface of said
4 microelectronic die.
- 1 12. A microelectronic device comprising:
2 a package substrate;
3 a microelectronic die mechanically coupled to said package substrate, said
4 microelectronic die having a plurality of electrical contacts that are conductively
5 coupled to contacts on said package substrate; and
6 a fiber reinforced encapsulation material mechanically coupled to said
7 microelectronic die to provide structural support for said microelectronic die, said fiber
8 reinforced encapsulation material including a polymeric resin having a fibrous filler
9 material.
- 1 13. The microelectronic device of claim 12, wherein:
2 said fiber reinforced encapsulation material forms a fillet between said
3 microelectronic die and said package substrate.
- 1 14. The microelectronic device of claim 12, wherein:
2 said fiber reinforced encapsulation material forms a globule covering said
3 microelectronic die.

1 15. The microelectronic device of claim 12, wherein:
2 said package substrate includes a flexible circuit board.

1 16. The microelectronic device of claim 15, wherein:
2 said fiber reinforced encapsulation material fills a region between said
3 microelectronic die and said flexible circuit board.

1 17. The microelectronic device of claim 12, wherein:
2 said fibrous filler material includes individual fibers having a length between
3 1 micrometer and 40 micrometers and a length to width ratio that is no less than 5.

1 18. A method for manufacturing a microelectronic device comprising:
2 providing a package core having an opening therein;
3 positioning a microelectronic die within the opening in said package core; and
4 dispensing a fiber reinforced encapsulation material into said opening in said
5 package core to fill a gap between said microelectronic die and said package core, said
6 fiber reinforced encapsulation material including a polymeric resin having a fibrous
7 filler material.

1 19. The method of claim 18, wherein:
2 dispensing a fiber reinforced encapsulation material includes creating a flow of
3 encapsulation material about said microelectronic die in a direction that is
4 approximately perpendicular to a direction of anticipated crack formation.

1 20. The method of claim 19, wherein:
2 said direction of anticipated crack formation is an outward direction from a
3 corner of said microelectronic die.

1 21. The method of claim 18, wherein:
 2 said package core includes a first channel in fluid communication with said
 3 opening, wherein dispensing a fiber reinforced encapsulation material includes injecting
 4 said fiber reinforced encapsulation material into said first channel.

1 22. The method of claim 21, wherein:
 2 said package core includes a second channel in fluid communication with said
 3 opening, wherein dispensing a fiber reinforced encapsulation material includes creating
 4 a partial vacuum within said second channel.

1 23. The method of claim 18, comprising:
 2 applying a first protective film over a first surface of said package core before
 3 dispensing said fiber reinforced encapsulation material, said first protective film
 4 covering said opening in said package core.

1 24. The method of claim 23, comprising:
 2 applying a second protective film over a second surface of said package core
 3 before dispensing said fiber reinforced encapsulation material, said second protective
 4 film covering said opening in said package core.